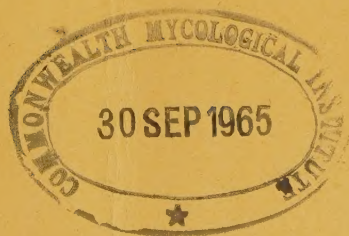


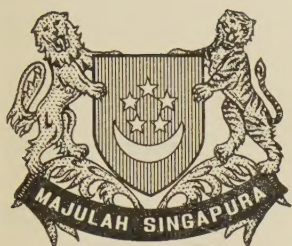
STATE OF SINGAPORE

ANNUAL REPORT OF THE BOTANIC GARDENS DEPARTMENT FOR 1960

	NSP	
	RAM	
	MM	



Price: \$1



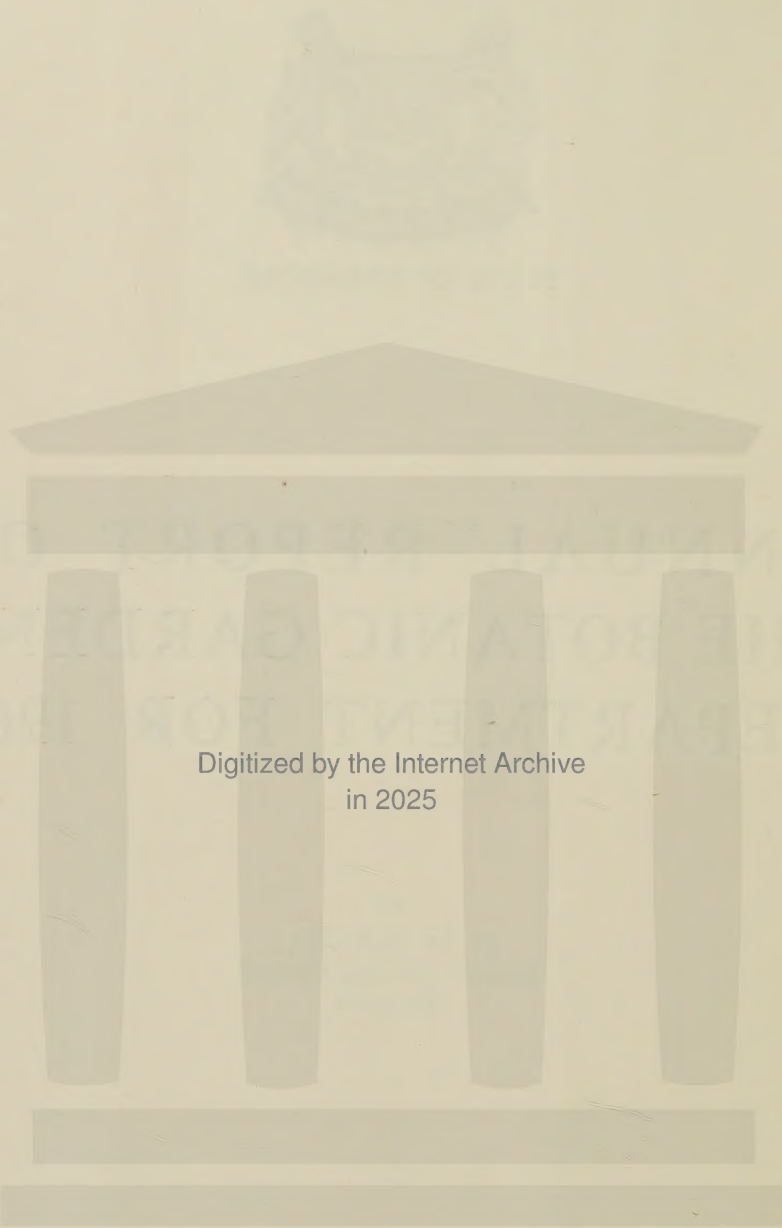
STATE OF SINGAPORE

ANNUAL REPORT OF THE BOTANIC GARDENS DEPARTMENT FOR 1960

BY

H. M. BURKILL

*Director, Botanic Gardens
Singapore*



Digitized by the Internet Archive
in 2025

CONTENTS

ADMINISTRATION

	<i>Paragraphs</i>
I Staff - - - - -	1- 2
II Training - - - - -	3- 4
III Labour - - - - -	5
IV Buildings and Roads - - - - -	6- 8
V Visitors - - - - -	9-11
VI Concert - - - - -	12
VII Publications - - - - -	13-15
VIII Library - - - - -	16-17
IX Agricultural Pests Supervisory Committee - - - - -	18
X Commonwealth War Graves Commission - - - - -	19
XI Nature Reserves - - - - -	20-22
XII Meteorological - - - - -	23

BOTANICAL RESEARCH

XIII Collecting and New Records - - - - -	24-47
XIV Exchange and Acquisition - - - - -	48
XV Taxonomy - - - - -	49-57
XVI Loans of Herbarium Material - - - - -	58-59

HORTICULTURE

XVII Gardens Maintenance - - - - -	60-64
XVIII Pests and Diseases - - - - -	65-70
XIX Horticultural Exchange - - - - -	71
XX Istana Negara Domain - - - - -	72-74
XXI Orchids - - - - -	75-80
XXII Succulents - - - - -	81

EXTENSION WORK

XXIII Supply of Planting Material - - - - -	82-84
XXIV Exhibitions and Shows - - - - -	85-91
XXV Singapore Gardening Society - - - - -	92
XXVI Malayan Orchid Society - - - - -	93-94
XXVII Malayan Nature Society - - - - -	95
XXVIII Film Production - - - - -	96
XXIX Advisory - - - - -	97-98

APPENDICES

Staff, Divisions I-III	-	-	-	-	-	I
Meteorological Records	-	-	-	-	-	II, III
Distribution of Herbarium sheets by gift, exchange and loan	-	-	-	-	-	IV
List of Institutions donating planting material	-	-	-	-	-	V
List of Institutions receiving planting material	-	-	-	-	-	VI
Map showing location of Malayan place names mentioned in this Report	-	-	-	-	-	VII

ADMINISTRATION

I. STAFF

THERE WAS NO CHANGE in establishment during the year. The improvement of the staff position recorded in last year's report was maintained. One Curator's post was vacant for the first 8 months of the year, but by the end of 1960 all Division I and II posts were substantively filled. The important subordinate post of Horticultural Assistant in Division III, vacated by promotion of the holder, remained vacant for the last four months of the year. The services of Dr. C. X. Furtado were retained till August as a replacement officer for staff away on training. The Director, away on overseas leave from mid-December 1959 returned to duty on 9th February. During his absence Mr. Alphonso acted as Director.

2. In the 1957 Report a new venture in staff employment was recorded, the appointment of a totally blind telephone operator, the first blind person so employed in Singapore. Another successful venture can now be reported. A few years ago a cured patient of Trafalgar Home was taken onto the Gardens' establishment. Only the man concerned, the Director of the Botanic Gardens, the hospital almoner and the confidential branch of the Establishment Office knew the medical details of this appointment. For obvious reasons, till the man had established his niche amongst his new colleagues, the matter has remained a secret. Now after several years of working here, there cannot be any valid objection by those with whom he works to a continuation of this harmony, even though they may now learn his history. May this be an example to help in breaking down age-old ignorant social prejudice which besets persons cured of leprosy when they leave the confinement of their isolation after successful treatment.

II. TRAINING

3. Dr. Chew Wee Lek, Botanist, awarded a Government Fellowship to study for a Ph.D. degree at Cambridge University, returned to duty on 18th August after successful completion of his course of study.

4. From 28th October to 8th December, Dr Chew Wee Lek attended an U.N.E.S.C.O. Field Training Course held in West Java. The course, which was fully financed by U.N.E.S.C.O., and run by the staff of the Bogor herbarium, was intended to teach young botany graduates how to work in the forest under primitive conditions.

III. LABOUR

5. The labour force was on average 71 labourers and gardeners in the Botanic Gardens, 54 in the Istana Negara Domain, 8 men in the Nature Reserves, and 2 men and 2 women in the herbarium.

IV. BUILDING AND ROADS

6. Gardens resources undertook the following work:

- (i) A new wooden bridge on the path around the Lake was put up over the overflow spillway. The path itself was also raised and resurfaced on the south and south-western sides of the Lake. The path edges were curbed to prevent erosion.

- (ii) Two plant houses were built, one for orchid seedlings, and the other for foliage plants.

7. The Public Works Department did:

- (i) Repairs to the fabric of the herbarium.
- (ii) Redecoration of all the office buildings.
- (iii) Repairs and repainting of the band stand.
- (iv) Repainting of the orchid nursery fencing.
- (v) Patching of the roads.
- (vi) Repairs and redecoration to the Curator's quarters at 30 Cluny Road.

8. Contract sources installed a fire detector system in the herbarium and adjoining buildings.

V. VISITORS

9. Many official visitors called at the office including:

Mr. J. M. Addis, U.K. Ambassador to Laos.

Professor M. E. D. Poore, Department of Botany, University of Malaya in Kuala Lumpur.

Mr. E. J. H. Berwick, Director of Agriculture, North Borneo.

Dr. R. Cleland and Mr. H. Coolidge, National Academy of Sciences, U.S.A.

Haji Abdul Malik, Governor of the State of Malacca.

Dr. Salim Ali, Bombay Natural History Society.

Mr. P. Weissich, Director, Foster Botanical Gardens, Hawaii.

Rear Admiral R. E. Portlock, Chief of Staff, Far East Station, Royal Navy.

Prof. Finn Sandberg, Royal Pharmaceutical Institute, Sweden.

Dr. D. D. Keck, National Sciences Foundation, U.S.A.

Lord Perth, Minister of State, London, and Lady Perth.

Mr. R. F. Wolf, Natural Rubber Bureau, U.S.A.

Professor V. J. Chapman, Auckland University College, New Zealand.

10. Visiting research workers who made use of the Gardens facilities were:

Mr. P. S. Ashton, Forest Department, Brunei. (Forest trees).

Dr. W. Meijer, Forest Department, North Borneo. (Forest trees).

Mr. D. J. Cloward, United Fruit Coy, Boston, U.S.A. (Bananas).

Mr. P. Allen, United Fruit Coy, Lancetilla Experiment Station, Honduras. (Bananas).

Prof. H. St. John, University of Saigon. (Pandanus).

11. Useful discussions were had with all the above visitors and visiting research workers. The latter by using the herbarium facilities added to the value of the material available to them by making notes, determinations, corrections and amendments as well as working on their own material brought for comparison.

VI. CONCERTS

12. There were 19 band performances by the Singapore Police Band during the year, which, as always, drew large crowds. Thanks are offered to the Commandant of the Singapore Police Force and to his band-masters. Two variety shows (the Aneka Ragam Raya'at) were put by courtesy of the Ministry of Culture.

VII. PUBLICATIONS

13. Printing of Supplement I by G. H. Addison to *Malayan Orchid Hybrids* was well advanced by the end of the year. Material for a second supplement is now available. *Gardens' Bulletin* 17 (3) was published in December. Staff members published the following papers:

BURKILL, H. M.: A Biologist amongst the Rubber Barons, *Family Forum* Christmas 1960 [A periodical of the British Services in Singapore].

FURTADO, C. X.: Superfluous Names and later Homonyms, *Taxon* 9 (5), 1960, 147-150. The Philological Origin of Areca and Catechu, *Principes* 4 (1) 1960, 26-31.

14. *Gardens' Bulletin*, Volume 6, was reprinted. This volume containing papers on local medicinal lore had been out of print for some time. With the marked revival of interest in recent years in phyto-chemistry, reprinting was undertaken to meet worldwide requests.

15. Botanic Gardens publications brought in \$9,848 revenue.

VIII. LIBRARY

16. The accommodation of the library remains unchanged. The books being stored in two separate rooms, neither of which was designed for this function and both badly needed for their intended purpose. One is an office room, the other is an extension of the herbarium in which the spirit collection of plants should be stored. This collection remains in the herbarium and is an embarrassing fire hazard. The lack of proper library accommodation is most unsatisfactory and it impedes the normal functioning of the library and holds up other work.

17. Library accession amounted to 243 volumes. This large intake of material adds to the difficulty of improper and inadequate accommodation. The accession register contained the titles of 8,047 volumes at the end of the year.

IX. AGRICULTURAL PESTS SUPERVISORY COMMITTEE

18. Mr. Burkill, Director, was a member of the committee.

X. COMMONWEALTH WAR GRAVES COMMISSION CEMETERY KRANJI

19. The Imperial War Graves Commission changed its name during the year to the Commonwealth War Graves Commission. The Director, Botanic Gardens, remained the Commission's representative in Singapore. The Botanic Gardens continued to supervise the horticultural and administrative work in maintaining the Cemetery under instructions from the Commission's Eastern Region Headquarters in New Delhi, India. Further information may be found in the Commission's own reports.

XI. NATURE RESERVES

20. The Board of Trustees consisted of:

Nominated by Yang di-Pertuan Negara	...	1. Mr. O. K. Abraham	...	w.e.f. 27-1-60.
		2. Mr. Morgan Khoo Kay Ann	...	
The Minister for National De- velopment	...	3. Mr. Tan Hoon Siang	...	
		4. Prof. H. B. Gilliland	...	
The City Council	...	5. Mr. Tan Jake Hooi	...	up to 36-9-60.
		Mr. Khong Kit Soon	...	w.e.f. 1-10-60.
The Rural Board	...	6. Mr. Chan Chiaw Thor	...	up to 30-9-60.
		Mr. R. Ramalingam	...	w.e.f. 1-10-60.
Chairman, ex-officio	...	7. Director of Botanic Gardens.		

21. Normal maintenance was continued during the year. The Board held one meeting. Formal Government approval was given to the Army for the construction of additional small arms ranges within the danger area of the existing ranges in the Water Catchment Area.

22. Considerably increased numbers of people are availing themselves of the amenities for recreation in the Reserves and litter at certain points is becoming a nuisance. Organised parties of school children are the main offenders and collaboration of the schools' authorities is being solicited to try to instill a sense of civil consciousness on this matter.

XII. METEOROLOGICAL

23. Observations were continued at the two sites in the Botanic Gardens. A summary of recorded information is given in Appendices II and III. The year was noteworthy for being the driest since 1941, and the second driest since 1914 when reliable recordings were first begun in the Gardens. The year's rainfall was 21 inches below average for the period 1914-60, but rain was recorded on more days than during the past few years. The November-December-January monsoon period of 1959-60 was appreciably wetter than normal and the rains extended into February to stop abruptly in March. February was the wettest month for the year with 10.04 inches of rain and March the driest with 2.24 inches. The monsoon at the end of the year failed to break in November. This month was the third driest in the year with 3.41 inches while on average it has 10.47 inches. December's rainfall was also under average. The short-fall in rain appears to have had little effect on the other phenomena recorded, but the relative dryness of the year has made its impression on tree flowering which has been as a result very much more abundant.

BOTANICAL RESEARCH

XIII. COLLECTING AND NEW RECORDS

24. Many single day collecting trips were made into the Nature Reserves and countryside on Singapore Island which yielded valuable material, but the bulk of the collecting work was done on the following expeditions:

J. Sinclair	...	Johore: Kota Tinggi-Mersing Road, 5½ m.s. and 12½ m.s.	13/1	5 nos.
J. Sinclair	...	Johore: Kota Tinggi-Mersing Road, 4½ m.s.	26/2	5 nos.
J. Sinclair	...	Mawai-Kuala Sedili New Road	4/3	10 nos.

J. Sinclair	...	Mawai-Kuala Road	Sedili ...	New ...	30/9	9 nos.
J. Sinclair and Kadim bin Tassim	...	Sarawak and Brunei	...	...	31/7 - 7/9	374 nos.
A. G. Alphonso and Samsuri bin Ahmad		Kedah: Langkawi group P. Dayang Bunting, P. Umban, P. Bumbon Kechil, P. Singa Besar, and P. Langkawi			29/11- 9/12	73 nos. for herbarium 28 alive for cultivation
H. M. Burkill	...	Malacca: Tj. Kling, Tj. Bidarak	...	...	15-17/4	23 nos.
		Johore: K. Sedili New Road			25/4	19 nos.
		Johore: Bt. Takadai, Mersing, and Sri Pantai	...		3- 5/5	29 nos.
H. M. Burkill and Md. Shah	...	Johore: Kota Tinggi-Mersing Road, Kg. Selantai, P. Batu Gajah	...		7-10/8	48 nos.
		Pahang: Tokong Burong	...			3 nos.
H. M. Burkill, Md. Shah and Md. Noor		Pahang: Fraser's Hill	...		14-22/8	136 nos.
H. M. Burkill	...	Singapore: Raffles Light	...		March-December periodic visits for Sargassum alginic acid assay	26 nos.
Chang Kiaw Lan	...	Penang: Waterfall Gardens and Penang Hill	...		23-30/1	15 nos.
Chang Kiaw Lan	...	Penang: Balik Pulau, Waterfall Gardens, Penang Hill, Batu Ferringi	...		11-24/5	50 nos.
Chang Kiaw Lan	...	Kedah: Kedah Peak, P. Langkawi, P. Dayang Bunting, Gunong Mas F.R., Telui F.R. near Kg. Weng	...		1-17/10	342 nos.
Chang Kiaw Lan	...	Perlis: Kaki Bukit and limestone hill between Kangar and K. Perlis	...			
Chang Kiaw Lan	...	Johore: Kota Tinggi-Mersing Road	...		13/1	10 nos.
Chang Kiaw Lan	...	Johore: Kota Tinggi-Mersing Road	...		20/2	14 nos.
Chang Kiaw Lan	...	Mawai-K. Sedili Road	...		18/2	5 nos.

25. The salient features of this field work are noted below. Two of Mr. Sinclair's Johore excursions were to the Forest Reserves at the $3\frac{1}{4}$, $5\frac{1}{4}$ and $12\frac{3}{4}$ miles Kota Tinggi-Mersing Road in the beginning of the year. Here, *Horsfieldia tomentosa* was obtained as a first record for Johore while good fruiting material of *Knema mandaharan* was also collected. The only other Johore record for the latter is that of Mr. Corner's from the Sungei Sedili. Two trips were made to the Mawai-Kuala Sedili new road, where there is an extensive area of fresh water swamp forest on each side of the road. This extends back to the Sungei Sedili Besar. During the first visit, Dr. W. Meijer, Forest Botanist, Sandakan, North Borneo, then on a visit to Singapore and

Malaya, accompanied Mr. Sinclair, and was shown the area where he made a small collection, also noting some dipterocarp timber trees in the locality. On the second visit, Mr. J. A. R. Anderson, Chief Research Officer, Forest Department, Sarawak, was able to be present. He is an expert on swamp forest vegetation and was anxious to compare this type of swamp forest with similar regions in which he has worked in Sarawak. Unfortunately just before his visit a vast area of this most interesting type of primitive virgin forest had been felled and all the trees including even the larger timber species with all their epiphytic flora of orchids and festoons of climbers completely burned on the spot. At one point on the north side of the road good flowering and fruiting material of *Genianthus maingayi* (Asclepiadaceae) was obtained. This rarity has been collected only once in Malaya and there is a single rather scrappy and ancient specimen in the Singapore herbarium. On the opposite side of the road is ruined country recently burned and entirely denuded of the last vestige of plant life. It is very important that some of this area should be preserved as a nature reserve since there is no swamp forest now left between Singapore and this place, a distance of 130 miles from the Gardens or University and back. It is also important for students of botany and zoology that this area be preserved so that it can be compared with the similar areas in Borneo, especially if we wish to have a complete phytogeographic picture of the rarer swamp forest species and their distribution. Some of the species will no doubt turn up in Borneo and *vice versa*, but we shall never know that precise facts if the land is stripped before scientists get a chance to make a proper enumeration. Many smaller animals, including snakes and insects must have perished in the blaze. Recently a mouse deer was seen in the area by the Singapore botanists. The larger animals, elephants, tigers and wild pigs are also here, but they will be forced to retreat into an ever-narrowing belt, until they are finally cornered and run to bay. Not even a roadside fringe of shade trees has been left in the burnt areas.

26. The trip to Sarawak and Brunei by Mr. J. Sinclair was one of outstanding success. The main object was to study the Myristicaceae in the field; to obtain as much missing information as possible on bark and field characters, ecology and distribution; to look for rare species, especially those which were imperfectly known as regards flowers or fruits and finally to use this information in revising and writing up the family for *Flora Malesiana*. At the same time other plants were not neglected. A good selection of Annonaceae, Dipterocarpaceae, Sapotaceae and other plants in flower and fruit was obtained amounting to 374 field numbers. The majority of these has now been named and distributed to other herbaria.

27. Mr. Sinclair arrived in Kuching by air on 31st July while Che Kadim bin Tassim, plant collector from Singapore Botanic Gardens arrived by the M.V. *Raja Brooke* with collecting equipment on 1st August. An excellent and judicious programme of itinerary had been previously arranged by Messrs. B. E. Smythies and J. A. R. Anderson of the Forest Department, Kuching, and everything went according to plan. The Botanic Gardens is most grateful to these two officers and to the Sarawak Government for their help. Sarawak is a most interesting place as many kinds of habitat exist in a small area and can readily be visited. The actual places where collecting was done had been well chosen and were fully representative of the major plant communities. These included primary forest on flat and hilly terrain, mountain forest with a distinct flora on Mt. Matang, fresh water swamp forest, beach forest, riverine flora on the Batang Kayan, the granite rocks at Lundu and the "kerangas" padang vegetation at Bako National Park.

28. The first visit, 2nd August, was to the Semengoh Forest Reserve or "Arboretum" where many of the trees have been labelled and are protected. Here Mr. Anderson makes frequent visits, always on the look out for trees in flower and fruit. A tree-house has been erected here where one can observe temperature, humidity and other meteorological data at various heights in the forest throughout the year. The forest was notable in that it contained a good many members of the Sapotaceae not seen in Malaya. Here also the Myristicaceae were fairly abundant and *Knema rufa*, a rare species collected by Beccari once only and in flower, was discovered by Mr. Sinclair on the first day of the trip. This was indeed fortunate for *K. rufa* was one of the special plants required for the monograph and it was seen in fruit for the first time. It was again obtained at Gunong Gaharu in fruit and at the Andulau F.R. in Brunei in male flower. Two more visits were paid to this forest reserve, namely on 3rd and 11th August, where it was relatively easy to collect material since one could choose from the numbered list any special tree that was wanted from which an expert tree climber provided by the Forest Department could collect specimens. From 4th-9th August the party went to Gunong Gaharu and Sungei Sabal Tapang, some 80 miles inland, near the Indonesian border. Mr. Smythies came also and Mr. Anderson arrived on the 6th. Accommodation was found for the party in a house belonging to a Chinese who was extracting "belian" logs, *Eusideroxylon zwageri* from the forest. The only persons to collect in this area previously were Nahar, a forest guard from Kuching, and Asah, the Forest Department's tree climber, who both made a preliminary visit to prepare for the advent of the Singapore party. They searched for Myristicaceae and these were shown to the Singapore members on arrival. Rare and little collected plants, obtained from Gunong Gaharu were *Macaranga setosa*, *Mammea anastomosa*, *Paramapania radians*, *Aporosa*, a new genus according to Airy-shaw, *Knema rufa*, *K. ashtonii*, *Gonystylus borneensis* and *Aetoxylon sympetalum*. *Upuna borneensis*, a very tall endemic Dipterocarp reaching to 180-200 feet, was plentiful.

29. A day was spent at the Bako National Park of which Mr. Anderson is warden. On the top of the ridge above the rest house is the stunted "kerangas" or padang vegetation. "Kerangas" is an Iban word meaning ground on which paddy will not grow. The substratum consists of podsolic sand, sandstone rocks and peat. A few plants are now mentioned which occur here and are representative of such a community:— *Cotylelobium flavum*, *Whiteodendron moultonianum*, *Tristania obovata*, *Calophyllum nodosum*, a peculiar species from 6 inches to 1 foot high, looking very much like a *Vaccinium*, *Alyxia pilosa*, *Vaccinium borneensis*, *Burmannia disticha*, *Dacrydium beccarii* var. *subelatum*, *Schoenus calostachys*, *Tetraria borneensis* and a new species of *Casuarina* formerly confused with *sumatrana*. In a stream at the foot of the hill *Dipteris lobbiana* was obtained while *Spilanthes urens*, a Composite with white flowers and the margins of the inflorescence bracts purple, was obtained creeping on the sand near the rest house. Here it was rare but was again found in some quantity at Muara Beach in Brunei. The latter record is the first for this species in Brunei. The plant has been found before at Sibuan in North Borneo but the Bako record is the first for the 1st Division of Sarawak.

30. The visit to Matang on 13th August was a rush and the actual summit was not reached. Good fruiting material of the rare *Knema pectinata*, also once collected here by Beccari in flower, was obtained at 2,000 ft. Near it were male and female trees of *K. cinerea* var. *cordata* in flower. The character of the flora began to change above this point when some crags were reached. Here there were some unique and interesting plants such as

Argostemma borraginea, *Steensia borneensis*, *Stilphonothrix ornata* and ferns such as *Diplazium porphyrorachis*, *Tectaria grandidentata*, *T. angulata* and *Thelypteris beccariana*.

31. The visit to Lundu and Gunong Gading lasted from 15th–19th August. This mountain and the Gunong Puey Range have some peculiar plants and are composed of granite while most of the rocks in the 1st Division are of sandstone. The granite ranges have not been inundated in recent geological times like the sandstone coastal areas and this may account for some of the peculiar plants found at Gading and Puey. A few rarities or endemics may be briefly mentioned here. G. Gading (1) base of mountain to waterfall—*Hallieracantha caudata*, *Piptospatha insignis* (the type locality), *Heterogonium stenoseminoides*, *Streblosa urticina* and a new variety of *Knema latericia* which also occurs higher up in the mid-zone, (2) above the waterfall—*Goniiothalamus rufus*, *Popowia odoardii*, *Aglaia unifoliata* (3) summit—*Loxocarpus longipetiolatus*, *Vaccinium borneense* var. *poianum*, *Ctenopteris repandulum* and *Lindsaya parallelogramma*.

32. A 3-hour trip by speed boat in the same area was made up the Batang Kayan to Gunong Meroyong, Sampadi Forest Reserve. Here there was a kerangas ridge where the following were obtained:—*Dipterocarpus rigidus*, *Elaeocarpus chrysophyllus*, *Ginalloa linearis* (a parasitic mistletoe), *Nepenthes albomarginata* and a new species of *Horsfieldia*, *Hosea lobbii*, an attractive *Clerodendron*—like a climber with orange-pink flowers and inflorescence bracts—was conspicuous and common in many places along the banks of the Kayan River.

33. On 25th August Mr. Sinclair and Che Kadim left Kuching by air and arrived at Brunei Town. They were met by the State Forest Officer, Inche Mohd. Yakin bin Long, and directed to Seria where headquarters were set up and a programme was planned. Thanks are especially due to the State Forest Officer and the Brunei Government who provided free transport to all the collecting sites as well as several assistants and a tree climber. The Keeper is deeply indebted to the Forest Department for providing a special motor launch for a trip from 29th–31st August up the Sungei Belait to Bukit Puan and back. The Singapore party is also indebted to the late Haji Abang Suhaili, District Forest Officer, Kuala Belait, and his men who accompanied them on all the excursions and arranged the details of each trip.

34. On 24th August a short visit was paid to Anduki Forest Reserve, Seria. Here the forest was composed of almost a pure stand of “Kapur paya”, *Dryobalanops rappa*, a tall timber tree with a mast-like trunk 100 feet or more in height. On the morning of 25th August a visit was paid to the forest at Sungei Lumut and in the afternoon to Andulau F. R. (North). In the former place the monotypic Ericaceous genus *Costera ovalifolia*, a crown epiphyte on *Myristica lowiana* was collected. In a swampy peaty area a pitcher plant *Nepenthes bicalcarata* and a tall dipterocarp, “Kukup”, *Shorea pachyphylla* were taken. In the latter place an interesting palm with stilt roots, *Eugeissona minor*, “tunjang pipit”, was collected. This tree is well-known locally for the excellent walking sticks which are made from the stilt roots, the handle being fashioned from the rhizome or stem-like portion where the stilt roots are attached.

35. On 26th August another trip was made to Andulau F.R., but at its western sector. Here some interesting Myristicaceae were obtained, some of which are new. A huge *Nephelium* species, a kind of wild “pulasan” 120 ft. high and probably new, was discovered. The fruits were found to be very

palatable. A peat-swamp forest at Badas with *Shorea albida*, "seringawan" as the dominant was visited on 28th August and again on 3rd September. Here felling of "seringawan" was in progress. The tree has large buttresses and from these arise enormous gnarled and tangled surface-roots which make walking very difficult. The interstices between the roots are crammed with saplings and ground flora and this covering hides the treacherous holes into which one's foot can easily slip. Several of the peat-swamp species enumerated by Anderson in his work on these forest were located here. A few are *Stemonurus scorpioides*, *Goniothalamus malayanus*, *Polyalthia hypoleuca*, *Lecananthus erubescens*, *Knema kunstleri*, *Ficus deltoidea* var. *motleyana* and *Combretocarpus rotundatus*.

36. As mentioned previously, the party proceeded to Bukit Puan on 29th August by launch and stayed there at a saw-mill. Collections were made from Bukit Puan, Bukit Labi and the river banks of the Sungei Belait above Bukit Puan. The main timber trees at Bukit Labi is *Agathis alba* subspecies *borneensis*, "tulang" (Malay), "bulu" (Iban), but it is not found in any great quantity. The Forest Department has started a nursery for young seedlings of this tree and it is hoped that they will reach maturity one day. The terrain in this area consists of sandy ridges and a new species of *Cyathocalyx* was taken here. There were also some plants which so far have not been identified. A new Hopea species *H. fluvialis* Ashton, common on the river banks, was gathered in fruit.

37. On 1st September, the party crossed the Belait and Baram rivers and visited Miri in the 4th Division of Sarawak, returning to Seria in the evening. A most puzzling shrub, locally called "balek angin" was common by the sandy roadsides at the 31st mile Miri-Kuala Baram Road, Sarawak. It was seen again on kerangas west of Muara Beach but both times without flowers or fruit. It was later identified at Singapore as *Alphitonia moluccana* (Rhamnaceae).

38. On Sunday, 3rd September, the party left Seria and arrived at the rest house in Brunei Town in preparation for the return to Singapore. A visit was paid to Berakas on 5th September to look for *Knema galeata*, a species hitherto found only in male flower. A few very old fruits were obtained but some time later the State Forest Officer sent excellent fruiting material of this species to the Gardens.

39. Finally one more plant must be mentioned which will at once strike anyone at all interested in vegetation visiting Brunei. It can be seen from the town rest house scrambling over the trees on the hillside in white patches, but is commoner at the 23rd mile by the Tutong-Brunei roadside. The plant on closer inspection will be seen to have purple flowers and is *Jacquemontia tomentella* var. *micrantha* (Convolvulaceae).

40. Mr. Burkill's collecting at Fraser's Hill was done while on casual leave. The major part of the specimens resulted from a strenuous slog to Pine Tree Hill, now safely accessible since the end of the emergency and the clearing of the forest of terrorists. The party had the company, fortunately at a respectful distance, of a 'seladang' cow and calf (*Bos gaurus hubbacki*), both going and returning. A number of new or rare records for the Fraser's Hill area were recorded including: a *Sonerila* sp. not matched in Singapore, *Dischidia gaudichaudii*, *Coelogyne stenochila*, *Camptosperma minor*, and *Pyramidantha prismatica*. *Liparis purpureo-viridis*; an attractive ground orchid known only from Fraser's Hill and Gunong Tahan was seen in flower in great abundance. The fern *Matonia pectinata* collected at the

summit of Pine Tree Hill, and later on the Jeriau Road and seen elsewhere, is apparently spreading and becoming more common in the Fraser's Hill area.

41. Most of the other collecting done by Mr. Burkill was of marine algae. A course of monthly visits was paid to Raffles Light off Singapore Island to sample the year-long cycle of growth of *Sargassum* spp. for testing the alginic acid content. The weed is entirely broken off in February leaving only the hold-fast and basal 2-3 inches from which the new growth emerges. The young stems contain little alginic acid, but the percentage increases to about 25 per cent later in the year and stays at this figure. Unfortunately this is not a high enough concentration to suggest that local sargassum weed could at present be exploited commercially in the face of the more productive weed of temperate waters, but it may become so with the greatly increasing usage of alginic acid in industry. Alginic acid assays were done by the Tropical Products Institute in London to whom thanks are due for their help.

42. An interesting visit was paid to P. Tokong Burong while at Mersing to see the vegetation of these rocky islets inhabited by a dense colony of seabirds, *Sterna s. sumatrana*, the black naped tern. The soil is sparse and is almost entirely made up of grit and faecal droppings of the birds. The only vegetation found was a plentiful tussock cover of *Chrysopogon collinus* on the cliffs and upper slopes of the rocks between which the birds nest and hatch single eggs, and occasional clumps of *Cyperus polystachyos* at the base of the cliffs in the splash zone of the waves. Standing water, very rich in faecal nitrogen, was coloured a vivid green by *Chlamydomonas*. The water also contained a xanthophycean.

43. Mr. Alphonso's visit to the Langkawi group of islands was made possible by the kind cooperation of the Commanding Officer of the Singapore Guard Regiment who invited the Gardens to lend a botanical flavour to a party of troops undergoing jungle exercises. Major R. Brewer, in command of the party, was extremely helpful and cooperative in detailing soldiers for assistance whom we hope learnt, as a suitable *quid pro quo*, something of the vegetation, and that the forest was not just "jungle" to be hated and avoided but a living entity in which man can be and work. The main object of the collecting was to obtain living plants of ferns and orchids for the Botanic Gardens nurseries.

44. The Department is indebted to Mr. Cheang Kok Choy, Superintendent of the Penang Botanic Gardens, who gave Miss Chang considerable assistance on her expeditions to Langkawi and to Kedah Peak. Help was also given by Mr. Abdul Kareem Hussain of Balik Pulau, Penang, and various *ketuas*; also the lumbering contractor working on the new road to Sik who loaned jeep transport, and the sawmill manager at Kulim who loaned labourers and transport.

45. Miss Chang's main collections have been of fungi, mostly of the group *Basidiomycetes*. In this group most *Boletes* and some agarics have been found to be mycorrhizal. Information into the specificity of host trees should yield invaluable useful information to forest botanists and silviculturists engaged on problems of afforestation. In Singapore a feeble fructification season occurred in April. There was a more pronounced season in January which would normally have occurred in the preceding November had the monsoon rains not been delayed. The January season was also

peculiar for containing much fewer species of *Boletes* and agarics than usual. *Cantharellus cibarius*, abundant in 1959, was wholly absent. Fructifications of *Hydnum repandum* were found in great abundance.

46. A number of instances of mushroom poisoning were brought to the attention of the Gardens by the Medical and Chemical Departments for identification of the fungus concerned. Two instances involved *Lepiota* spp. In both cases the fructifications were gathered from the foot of banana clumps. One was identified as the poisonous *L. morgani* and is thought to be mycorrhizal on bananas. The other could not be identified with certainty. If indeed *L. morgani* grows in association with bananas, the public should be warned to be careful of fructifications gathered from near banana plants. There are at least five species of *Lepiota*. Extracts of two growing on dung were made by an University physiology research worker who injected the extracts into rabbits. One extract caused no distress, the other produced diarrhoea. The genus *Lepiota* clearly has more than one poisonous species.

47. The Department also received fungus specimens from Jungle Warfare Training School in Johore. These were identified as *Lentinus* sp. (Sayor caju) and *Schizophyllum* sp. both of which are edible. While this is satisfactory to know, the J.W.T. School, conducting survival courses for forest-benighted servicemen, has indeed an overwhelming and unenviable task to put across such information and the like to those on whose memory of it depends perhaps their survival.

XIV. EXCHANGE AND ACQUISITION.

48. Specimens were again distributed to the usual botanical institutions outside Singapore. 3,901 duplicates were sent out as against 3,786 in 1959. Specimens received in exchange or as gifts numbered 3,829. This year the greatest number came from Mr. P. S. Ashton, Forest Department, Brunei, with contributions from the Forest Department, Kuching, and Dr. Kostermans at Bogor were next in order. Details of despatches and receipts are given in Appendix IV. Our thanks are offered to all who sent material. Accession of material through domestic sources amounted to 1,400 numbers.

XV. TAXONOMY.

49. Mr. Sinclair continued throughout the year his work on Malaysian *Myristicaceae* (Nutmeg family) in collaboration with the Flora Malesiana Foundation. His monograph on the genus *Knema*, prepared before his visit to Sarawak and Brunei, had to be considerably amended in the light of his findings there in the field. The revised text now far more complete was finished by the end of the year.

50. Work was begun on naming the abundant collections of P. S. Ashton from Brunei. This and material from other sources has severely taxed the capacity of the staff to keep pace and burdens the available space within the herbarium building, now curtailed by delapidations. The provision of further herbarium space has become an urgent necessity.

51. Dr. Chew Wee Lek on his return from overseas training began to rewrite his doctoral thesis on *Poikilospermum* (Urticaceae) and *Taxotrophis* (Moraceae) in a form suitable for publication. Concurrently he has begun work on the genera *Fleurya* and *Laportea* with the aim of undertaking a revision of the family Urticaceae.

52. Miss Chang has been able to make some progress with her initial work on the higher fungi, but sections are hampered by a very restricted library vote precluding the purchase of appropriate literature, and by the lack of a suitable microscope. The artist made 64 illustrations in colour as a beginning to an *icones fungorum*.

53. Dr. Furtado before he ceased to work on the Gardens' establishment completed the arrangement of the palm section of the herbarium and distributed all the duplicate material. He carried out routine determinations of incoming material sent for naming and of material brought in by students and teachers.

54. On a voluntary basis after ceasing to be on the establishment, Dr. Furtado sorted out material of Mangiferae, Guttiferae (*Calophyllum*), Rutaceae and parts of Fagaceae which had been accumulating over the past few years. He paid special attention to unnamed material from Sarawak, Brunei and North Borneo.

55. Dr. E. C. Abbe, Professor of Botany of the University of Minnesota, and Mrs. L. Abbe of the Department of Biology, MacAlister College, St. Paul, Minnesota (see para. 65 of the Report for 1959) spent about two weeks in Singapore on return from their expedition to Malaya, Thailand, Cambodia and Vietnam collecting and studying Fagaceae (Oak family). A duplicate set of the Abbes' collections will be deposited in the Singapore herbarium.

56. The facilities of the herbarium were made available to Messrs. Cloward and Allen of the United Fruit Company of the U.S.A. to study the collections of Musaceae (bananas). Mr. Allen's subsequent field collections of living material which have been duplicated to the Gardens have added valuably to our banana collection. Professor Harold St. John of Saigon University also made use of the herbarium to study Pandanaceae (pandanus).

57. Routine mounting, repairing of damaged sheets and poisoning proceeded but a very much reduced rate owing to the retirement of one of the two mounters. A replacement was found eventually. With the promotion of one of the two herbarium boys to the post of plant collector, it was decided to fill the vacancy with a third specimen mounter. Not only is there much material to mount but old sheets need repairing, particularly the very old sheets where the paper has become brittle with age.

XVI. LOANS OF HERBARIUM MATERIAL

58. Specimens sent on loan for study at other institutions numbered 2,595 sheets. The majority went to Leiden for workers engaged on the preparation of the *Flora Malesiana*. Other major borrowers were in India, Sweden, Vietnam. The principal plant families concerned were: Bombacaceae, Juglandaceae, Malvaceae (*Hibiscus*), Santalaceae, Niadaceae, Marsiliaceae, Haloragaceae, Simaroubaceae, and Coniferae (*Dacrydium*, *Podocarpus*).

59. Specimens received on loan for study in Singapore numbered 1,835 sheets. The main consignments were 832 sheets of Myristicaceae for Mr. Sinclair and 993 sheets of Urticaceae for Dr. Chew Wee Lek.

HORTICULTURE

XVII. GARDENS MAINTENANCE

60. The density of trees in the Gardens has reached such a concentration that further planting of important species and new introductions can only be done at the price of removing old trees whose performance is known and which are now established in commercial nurseries and in private gardens, no matter how beautiful they may be. Over a dozen unimportant trees or trees which are replicated in the Gardens were culled to make room for new plantings. Some 200 newly introduced plants established in pots await planting out. Notable losses of old trees were:

Cedrela glaziovii (Lawn C), an extremely handsome tree of about 80 ft. height, suffering from termite attack and die-back of the branches. Breaking branches damaged and endangered the herbarium roof.

Ficus benjamina (Lawn B), culled to improve the husbandry of other newer plants growing nearby.

Araucaria cunninghamii, storm damage (Lawn B).

Fagraea fragrans, storm damage. (Lawn F).

Elaeocarpus ganitrus, a gnarled specimen some 50 ft. high and a bole of 20 ft. girth which was completely hollow, culled to permit new planting on Lawn T. This lawn and adjacent Lawn Z in February 1942 during the Japanese attack on Singapore were subject to concentrated artillery bombardment. Many shells burst in the tree crowns. It seems likely that this *Elaeocarpus* and many other trees on these lawns which have died or are now slowly dying of die-back and fungal attack in the crown and the top of the trunk suffered damage during this bombardment 19 years ago which permitted fungal invasion. Similar damage has been reported amongst forest trees in the Federation through military and aerial action during the emergency.

61. Shrubs and trees pruned were *Trachylobium verrucosum*, *Caesalpinia pulcherrima*, *Erythrina glauca*, *Amherstia nobilis*, *Calamus scipionum*, 22 bougainvilleas and a *Bauhinia bidentata*. *Cyrtosperma lasioides* running rampant at the upper end of the lake was cut back; much of it will have to be eradicated as its roots are blocking the flow of water through the Dell Rockery into the Lake.

62. As a result of cutting out and losses by natural causes, it was possible to find space to put out 63 trees and shrubs, most of which were newly introduced plants. These changes necessitated amending the lawn plans which was done.

63. The canna beds along the side of Main Gate Road were dug out, manured and replanted. Other herbaceous beds were also manured with cattle dung and/or artificials. Sixty bushes of bougainvillea were trenched with cattle dung and compost. Four hundred and forty-two plant labels were made or repaired. The bank along the Lake and bordering the Main Gate Road was turfed.

64. A part of the orchid nursery was divided off for the purpose of displaying orchid plants to the public. This will permit a greater number of plants to be on show at any one time than was possible when the plants were put out in the plant house of Lawn L. Now about 130 plants, changed weekly, are on display at any one time.

XVIII. PESTS AND DISEASES

65. The long-tailed macaque monkeys (*Macaca irus*) remain the worst pest. Only four were shot during the year and none caught in traps. Shooting is of little avail as a single shot will scatter all the monkeys to the tree-top to

safety where they pour vituperation on the helpless Gardens' staff. The office shot gun was found to have bent barrels, and to this defect is attributed a major share of ineffective action. A number of plants particularly on Lawn A, E, F, H and L have been badly damaged by monkeys. Young palm seedlings on Lawn W have had to be caged in wire netting.

66. The reduction in incidence of rhinoceros beetle (*Oryctes rhinoceros*) reported in the 1959 Report has been maintained, but constant watch on compost heaps is necessary. Perhaps the nicotine content of small quantities of impounded and confiscated tobacco received through the Customs and Excise Department which has been mixed into compost heaps may help to reduce suitable nursery areas for larvae.

67. The red stripe weevil (*Rhyncophorus ferruginea*) remains a problem. Nine palms were killed by this insect during the year: *Versaffeltia splendida*; *Licuala grandis*; *Phoenix dactylifera*; 3 *Oreodoxa oleracea*; 2 *Sabal mexicana* and *Borassus machadonis*. Control of this beetle presents greater difficulties than of the rhinoceros beetle. It is usually the taller palms that are attacked and the crown does not show any symptom till after the fatal damage has been done.

68. An attack of banana stem borers (Coleoptera) was discovered in a planting of banana varieties of Lawn T. The Commonwealth Institute of Entomology, London, determined the major damage as done by *Odoiporus longicollis*, and the minor pest as *Polytus mellerborgi*, recorded from the Philippines and Fiji, but only once previously from Malaya. The outbreak was successfully controlled by dusting the banana pseudostems with Agrocide 3.

69. An unidentified animal in the Lake continues to graze down the *Nymphaea preventing* re-establishment of the very decorative cover these plants gave to the Lake a few years back. Colonies of *Nymphaea* have been growing behind wire netting protection and whatever it is that likes to eat *Nymphaea* roots is clearly too large to pass through the 2 inch mesh of the netting. The turtles (*Trionyx cartilagineus*) in the Lake are suspect, but this hypothesis is unfortunately in conflict with zoological opinion which has it that these animals are wholly carnivorous.

70. *Dioscorea sansibarensis*, which was introduced to the Gardens some 45 years ago for the then Director's work on the genus *Dioscorea*, has persisted as a rampant, smothering weed around the perimeter of the Gardens but has never apparently spread further afield. In the past four years there has been very appreciable increase in its abundance, and steps have had to be taken to eradicate it. This feature of vigorous colonisation of a locality without spreading from it is an interesting aspect of plant invasion ecology. It has a close parallel in the animal world in Malaya in the Ceylon Crows at Klang and more recently in the Singapore harbour area. In marked contrast is the spread of other introduced plants and animals such as *Cordia cylindristachya*, which will soon be a common waste-land shrub throughout most of Malaya, and the Giant African snail, *Achatina fulica*, long since spread from Singapore and Penang over the whole country in the lowlands of Malaya.

XIX. HORTICULTURAL EXCHANGE

71. Seed and plant exchange with other botanical organisations abroad was again an important aspect of the work of the Horticultural Division. Two persons were engaged full time on seed and plant collection in fulfilment of requests. Owing to the difficulty of storing seed in Singapore's humid climate

Dendrobium Noor Aishah
Cross No. BGS. 2134



H.M. Burkill



H.M. Burkill

See paras. 79 and 89 in this Report

Sargassum sea-weed beds at Raffles Light, Singapore



H.M. Burkill



See para. 41 in this Report

H.M. Burkill

Dipteris conjugata Reinw.



H.M. Burkill

At Summit of Pine Tree Hill, Fraser's Hill, on the Pahang/Selangor boundary
Altitude 4,780 ft.



H.M. Burkill

In the Labrador Nature Reserve, Singapore at sea level

Damage caused by Banana Stem Borers, Botanic Gardens, Singapore
Odoiporus longicollis OL and *Polytus mellerborgi* Boh.

See para. 68 in this Report



H.M. Burkill

Damaged pseudostem



H.M. Burkill

- (a) The largest three—*O. longicollis* OL
- (b) The smallest one—*P. mellerborgi* Boh.

stocks of seed are not retained for supply on demand. Discharge of requests in most cases have therefore to await the next seed harvest. Seeds and plants were sent to 180 addresses in 47 different countries. The Botanic Gardens received material from 67 addresses in 21 countries and seed exchange lists from 258 addresses in 51 countries—an "united nations" in the cause of botanical science. Addresses concerned in this exchange of material are given in Appendices V and VI.

XX. ISTANA NEGARA DOMAIN

72. The grounds were upkept in a good condition. A number of trees was struck by lightning and two (*Eugenia grandis*, 1, *Fagraea fragrans*, 1) were killed and had to be removed. Some 30 flowering trees were planted including *Cassia spectabilis*, *Millettia atropurpurea*, *Peltophorum pterocarpum*, *Spathodea campanulata*, *Terminalia catappa*, *Cinnamomum iners* and *Delonix regia*. Several clumps of yellow stemmed bamboo were planted on the edge of the golf course. As usual the trees, greens and fairways of the course were well maintained. An epidemic spread of *Elephantopus scaber* appeared in the fairways. This plant is wind dispersed. The flowering stems are usually 6–8 inches long but under impact of frequent mowing they flowered on inflorescences only 1–2 inches high which in general escaped cutting by mowers. The usual selective weed-killers for broad leaved plants proved unable to kill the plant and hand forking and lifting of the tough taproot had to be adopted. At various places in the Domain over 30 chains of hedging were planted, a half of it *Baphia nitida*, the balance being *Acalypha siamensis* and *Cordia cylindristachya*.

73. It is sad to record that our friend, the bountiful elephant, referred to in para. 86 of last year's report was sent early in the year to the Federation of Malaya. For composting it has been necessary to rely on the less efficient product of the domestic cow.

74. The Istana grounds were opened to the public on New Year's Day (1/1/60), Chinese New Year's Day (28/2/60), Hari Raya Puasa (28/3/60) and on Deepavali (19/10/60).

XXI. ORCHIDS

75. The collection of species and hybrids continues to expand rapidly. Eighty-two numbers of species were collected by Gardens' staff while on field work at Cameron Highlands, Fraser's Hill, in Kedah, on Pulau Langkawi and elsewhere. A number was received from outside sources particularly from North Borneo, New Guinea and Brunei. Of the species received, 18 flowered in the nursery and were identified. The collection was also expanded by exchange: 230 plants, cuttings and seedlings were given, 240 were received. Individuals and organisation concerned are listed in Appendices V and VI.

76. Fifty-two hybrid pods were harvested from our own nursery, 12 were received from Singapore growers, four from the Federation of Malaya and three from Sarawak. Of these 71 pods, 50 proved to be fertile and were successfully germinated. Seedlings from 407 flasks reached potting out stage and were moved from flasks in the laboratory to pots in the nursery. The flask culture medium used, as previously, was based on Vacin's prescription; however the coconut water added was diluted to 10 per cent strength instead of 25 per cent. Extensive teratological growth in the flasks of many of the families has been ascribed to the presence of an excess of growth regulators

in the coconut water. Greater use was made of added banana pulp. Excellent results came from the use of both banana pulp and the more dilute coconut water. Over 1,200 flasks were in use.

77. An additional seedling house was built making, now five houses in all. These accommodated about 11,500 seedlings at the end of the year. Some 1,881 seedlings graduated to be grown in the open. Thirty-nine new beds were prepared and planted for large scale multiplication of selected varieties of arachnis-type hybrids.

78. A large proportion of the seedlings will be sold unflowered from the seedling house to the nursery trade and to the public through the Gardens' plant sales office. Also considerable quantities of off-shoots and cuttings of mature selected hybrids will be sold. It is this ready supply of proven and new but promising material upon which Singapore's young and growing orchid nursery trade vitally rests. But the limitations of space are becoming a critical handicap. In the past six years the collection of orchids has expanded from a space little bigger than a tennis court till now it occupies 3 acres—and that after disposal by sale of enormous numbers of seedlings for which neither house or nursery room can be found. Without the provision of further space for seedling houses and nursery area, this work cannot continue at the present tempo which has won a considerable reputation for Singapore.

79. The following hybrid families which flowered for the first time in 1959 were registered:

BGS—

1672 *Brassidium* Tan Lean Bee (*Brassia maculata* × *Oncidium lanceanum*).

1823 *Opsisanda* George Addison (*Vanda Kapoho* × *Vandopsis lissochiloides*). This cross is named after Mr. G. H. Addison, Curator, Botanic Gardens, Singapore, 1938-59, who had charge of the Gardens' work on orchid hybridising for several years.

2440 *Dendrobium* Heng Mui Keng (*D. leporinum* × *D. Leeanum*).

Flowering for the first time were siblings of the following families:

BGS—

2353 *Dendrobium* Tan Teo Kim (*D. Ursula* × *D. Tan Chye Siam*).

2134 *Dendrobium* Noor Aishah (*D. capra* × *D. Champagne*). This cross is named after the wife of Singapore's Head of State.

2013 } *Vanda* Ruby Prince × *Vandanthe Ellen Noa* (Proposed name V'the
2302 } *Kupu-kupu*).

2196 *Arachnis Hookeriana* var. *luteola* × *Vandanthe Tatzeri* (proposed name *Arandanthe Bintang*).

2194 *Vanda dearei* × *Vandanthe Tatzeri* (Proposed name *Anna Jackson*).

2327 *Dendrobium* Medusa × *D. Ursula*.

2325 *Dendrobium* Louisae × *D. Constance*.

2651 *Dendrobium* Pompadour 'Phra Tabā' × *D. Rose Marie*.

2059 *Dendrobium* Mt. Waialeale × *D. Champagne*.

2050 *Dendrobium* Clara Cooper × *D. Constance*.

2516 *Dendrobium* Gouldii × *D. mirbellianum*.

2437 *Dendrobium undulatum* var. *broomfieldii* × *D. sp. indet.* (N. Guinea).

2261 *Dendrobium* Medusa × *D. Constance*.

2696 *Dendrobium* Louisae (dark form) × *D. Lady Constance*.

2502 *Dendrobium* Indonesia × *D. Champagne*.

2348 *Dendrobium* Dang Toi × *D. morganster*.

BGS—contd.

- 2007 *Dendrobium* Joanne Sawers $\times$ D. Pauline.
3040 *Dendrobium mirbellianum* $\times$ D. bigibum.
2255 *Vanda limbata* $\times$ V. lamellata.
1953 *Vanda trisum* $\times$ *Phalaenopsis serpentilingua*.
1841 *Vanda Kapoho* $\times$ V. insignis.
1268 *Vanda dearei* $\times$ V. luzonica.
1806 *Arachnis* Maggie Oei $\times$ *Vanda insignis*.
1849 *Arachnis hookeriana* var. *luteola* $\times$ *Vandanthe* Ellen Noa.

80. Seven mature plants were supplied for a state gift to H.M. The Yang di-Pertuan Agong of the Federation of Malaya, and five as a state gift to the Sultan of Brunei.

XXII. SUCCULENTS

81. The collection was added to by donations of seeds from other institutions. Many species grow freely. These were multiplied for sale. There is an appreciable public interest in these plants.

EXTENSION WORK

XXIII. SUPPLY OF PLANTING MATERIAL

82. A total of 16,455 plants, cuttings, lots of bulbs and packets of seeds were sold to the public during the year. Revenue to \$21,612.90 was obtained, of which \$17,676 came from the sale of orchid material and the balance by sale of other plants.

83. The Gardens continued to supply planting material free of charge to Singapore government departments, charitable institutions, government-aided schools and other official or quasi-official organisations. Distribution was:

	<i>Plants</i>
Police Stations and Magistrates' Courts ...	185
Schools and Universities ...	3,055
Hospitals ...	184
Other Government departments ...	415
Military ...	645
Charitable organisations ...	231
Total ...	4,715

84. The Gardens also continued to loan potted plants to official and quasi-official departments and to welfare and cultural organisations for decoration at special occasions; 4,257 pots were so loaned. Social Welfare Department alone borrowed 1,365 pots.

XXIV. EXHIBITIONS AND SHOWS

85. The Gardens participated in several shows during the year and won awards. The most notable event was the sweeping success of the Malayan Orchid Society exhibit at the Third World Orchid Congress staged at the Royal Horticultural Society Chelsea Show in London in May. The Botanic Gardens were the major contributor of blooms in this cooperative effort by members of the Malayan Orchid Society. The Society's exhibit won the

highest award, the R.H.S. Gold Medal, and as a result the Fourth World Orchid Congress has been attracted to hold its meeting in Singapore in 1963. Vandanthe Wendy Scott 'Blue Bird', a cultivar of a cross made in these Gardens and grown by Mr. Boey Chun Heng, was given an Award of Merit.

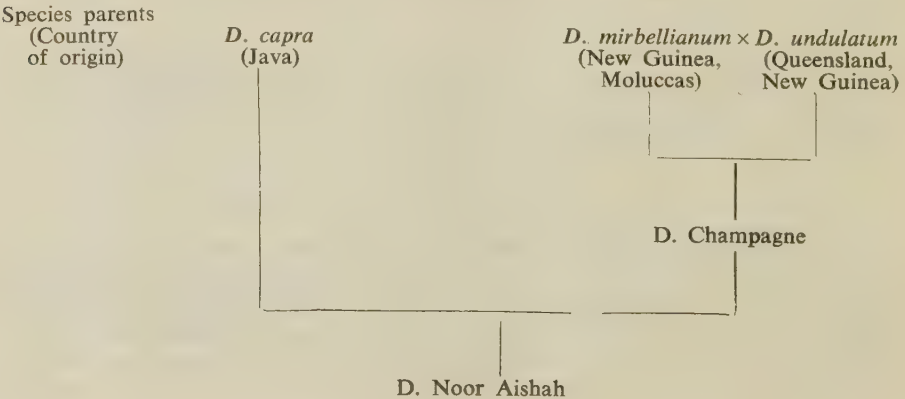
86. The Botanic Gardens participated at the Malayan Agrihorticultural Association Exhibition in Kuala Lumpur, 29–31 July, and staged a non-competitive exhibit which was the outstanding attraction of the horticultural section. A large quantity of plants was taken for sale and \$2,222.50 was obtained as revenue. Mr. H. M. Burkill and Mr. A. G. Alphonso were both judges in the horticultural competitive sections of the exhibition.

87. The Gardens staged the centre piece for the Annual Flower Show under the auspices of the Singapore Gardening Society held at the Happy World Stadium 1–3 April. This was a landscape of near 800 square feet of a garden around a miniature waterfall. Mr. Burkill was Chairman of the Show Committee and Mr. Alphonso was the Show Manager. Many members of the Gardens were judges for the competitive sections.

88. The Annual Show of the Malayan Orchid Society was held 30th September to 2nd October also in the Happy World Stadium. His Excellency the Yang di-Pertuan Negara opened the show. The following are extracts of his opening speech:

“The year 1960 will go down in history as a very auspicious year for the Malayan Orchid Society. In winning the coveted gold medal at the world-famous Chelsea Show . . . the Malayan Orchid Society has won world acclaim for her orchids . . . I am glad to say that more than 90 per cent of the blooms were hybrids raised in Malaya . . . The Botanic Gardens have pioneered the work in this branch of horticulture . . . and it is gratifying to know that apart from the Botanic Gardens there are no less than 40 people in Singapore alone, who are doing their own crossing and breeding . . . During the last four years the Malayan Orchid Society, the Singapore Gardening Society and particularly the Botanic Gardens have been sending orchid blooms for exhibition overseas . . . it is the overseas exhibitions that will publicise and popularise the many new hybrids which are continually being produced in Malaya . . . with encouragement and guidance from the Malayan Orchid Society and its sister Society, the Singapore Gardening Society, and the technical advice and assistance from the Botanic Gardens, I have no doubt that an orchid industry can be established . . .”

89. The Gardens put up a non-competitive group of some 200 orchid plants landscaped in a rock garden around a “summerhouse” and miniature pool. The Challenge Cup for the best local hybrid flowering for the first time was won by a plant of *Dendrobium* Noor Aishah raised from a cross made in the Gardens. The pedigree of this hybrid is:



90. The Penang Gardening Society held its annual show in Georgetown 25–27 November. The Malayan Orchid Society and the Botanic Gardens put up a joint non-competitive exhibit of cut blooms which replicated in a small way the exhibit staged at Chelsea for the World Orchid Congress in the preceding May. The Governor of Penang was so taken with the exhibit that he instructed the President of the Penang Gardening Society to send congratulatory letters to both the Malayan Orchid Society and the Botanic Gardens. Mr. A. G. Alphonso assisted in judging competitive sections of the show.

91. The Gardens also sent flowers to the Florida Federation of Garden Clubs Flower Show, the Jesselton Flower Show, the Glasgow Flower Show, the Royal Commonwealth Society's Flower Show at Sydney, the Selangor Orchid Society's Show and the Federation of Malaya Orchid Society's Show.

XXV. SINGAPORE GARDENING SOCIETY

92. Mr. H. M. Burkill and Mr. A. G. Alphonso were respectively President and vice-President for the year 1960/61. Regular monthly meetings were held, six of which were in the Botanic Gardens, and two by courtesy of the Yang di-Pertuan Negara in the Istana Negara Domain. The Botanic Gardens staff also arranged eight meetings for members' gardeners at which practical demonstrations were given.

XXVI. MALAYAN ORCHID SOCIETY

93. Mr. A. G. Alphonso served on the committee for the year 1960/61. The Gardens continued to contribute descriptions of new hybrid families for publication in the *Malayan Orchid Review*. The Gardens collaborated with Dr. Yeoh Bok Choon in the preparation of *A List of Malayan Orchid Hybrids, 1893–1960*. A number of Gardens' hybrids were displayed at monthly meetings.

94. The Botanic Gardens staff learnt with great regret of the death of Mr. John Laycock on 3rd December at the age of 73 years. Mr. Laycock was a friend of long standing of the Botanic Gardens and it was his enthusiasm for collecting orchid species from the various countries he was able to visit which was one of the basic starting points for the hybridisation of orchids in Singapore over 30 years ago. His collaboration with Dr. Holtum, then Director of the Gardens is today producing remarkable returns, and will, we are certain, continue to do so. Mr. Laycock was one of the founding fathers of the Malayan Orchid Society.

XXVII. MALAYAN NATURE SOCIETY

95. Mr. H. M. Burkill served on the main committee of the Society and on the Committee of the Singapore branch. Many field outings were held, some of them into the Nature Reserves.

XXVIII. FILM PRODUCTION

96. Two studios were at various times engaged on shooting scenes for film stories. Particularly as the actors are usually in exotic attire, this is a source of much interest and attraction to visitors, especially those from overseas.

XXIX. ADVISORY

97. Many visits were paid by the horticultural staff to advise on planting schemes in school and hospital compounds, cultural centres, the grounds of the new National Library and other official sites. Many requests from the public and from unofficial bodies were similarly dealt with. The tree planting programme for shade and aesthetic improvement in school grounds became a major undertaking as scores of schools put in their requests for assistance. Some schools put up their own plans, sometimes with obvious humour such as one requiring a "sugar" palm outside the school tuckshop.

98. The botanical staff continued to deal with enquiries relating to identity and uses of economic plants. Many concerned the identity of samples of seaweeds, commercial value and the availability of certain sorts. As the world is looking more to the sea as a source of raw materials, this interest in algae will certainly increase.

STAFF OF BOTANIC GARDENS 1960

DIVISIONS I-II AND TECHNICAL POSTS OF DIVISION III

<i>Appointment</i>	<i>Holder</i>	<i>Notes</i>
Director ..	H. M. Burkill, M.A. (Cantab.), F.L.S. ..	Resumed duty after overseas leave 9/2.
Botanists ..	1. J. Sinclair, B.sc. (Edin.) ..	Keeper of Herbarium.
	2. Chew Wee Lek, B.sc. (Malaya) Ph.D. (Cantab.)	Resumed duty after overseas training 18/8. Assistant to Director.
	C.X. Furtado, D.sc. (Bombay)	Re-engaged pensioner as training replacement <i>vice</i> Dr. Chew Wee Lek up to 17/8.
	3. Miss Chang Kiaw Lan, B.sc. (Malaya)	
Curators ..	1. A. G. Alphonso	
	2. <i>Vacant</i> ..	Up to 8/9.
	Lam Hin Cheng ..	W.e.f. 9/9.
Librarian ..	Tan Kim Ho, B.sc. (Malaya)	
Executive Officer ..	R. S. Mani ..	
Laboratory Assistant (Special Grade) ..	<i>Vacant</i> ..	Up to 27/6.
	Bajuri bin Sappan ..	W.e.f. 28/6.
Horticultural Assist- ant ..	Lam Hin Cheng ..	Up to 8/9. Promoted Curator w.e.f. 9/9.
	<i>Vacant</i> ..	From 9/9.
Herbarium and Mu- seum Assistant ..	Mohamed Shah bin Haji Mohamed Nur	
Artist ..	Juraimi bin Samsuri	

METEOROLOGICAL REPORT

BOTANIC GARDENS, SINGAPORE

Reading daily at 9.30 a.m. local time at Gardens' Office

1960	Total Rainfall	Highest fall in 24 hrs.	No. of days of recorded rain	Mean Max. Temp.	Highest Max. Temp.	Mean Min. Temp.	Lowest Min. Temp.	Mean Temp. Dry Bulb	Mean Temp. Wet Bulb	Mean R.H. %
	ins. * 7.36 (11.30)	ins. 3.18	°F 17	°F 86.1	°F 90.0	°F 73.8	°F 71.0	°F 79.3	°F 75.8	% 84.3
January ..	10.04 (7.35)	1.83	18	86.6	90.5	73.5	71.5	79.4	75.9	84.4
February ..	2.24 (8.35)	0.91	13	89.6	93.0	74.7	72.0	82.1	75.0	79.1
March ..	9.02 (8.14)	2.20	17	88.9	93.5	75.5	72.8	82.2	78.2	83.3
April ..	5.30 (7.58)	1.71	16	90.5	94.5	76.3	73.5	83.0	77.8	82.9
May ..	8.03 (6.68)	4.28	17	88.2	92.0	73.3	72.5	81.8	78.3	85.2
June ..	8.29 (6.22)	4.33	14	87.3	91.5	75.6	72.5	81.0	78.2	87.6
July ..	3.23 (7.27)	1.07	11	88.7	93.0	76.9	73.5	82.2	78.8	85.3
August ..	4.90 (7.64)	1.10	19	87.9	90.5	75.5	73.0	81.7	78.0	84.3
September ..	5.53 (7.98)	1.79	14	88.7	91.8	75.4	72.8	82.5	78.1	81.6
October ..	3.41 (10.47)	0.54	23	86.3	91.0	74.7	73.2	80.0	76.9	86.8
November ..	9.69 (9.93)	2.69	20	86.1	90.5	74.2	71.0	79.9	76.3	85.2
December ..										
Total/Mean ..	77.04 (98.71)	..	199	87.9	91.8	75.0	72.4	81.3	77.3	84.2

* Mean for the period 1914-1960 /(47 years).

METEOROLOGICAL RECORD

BOTANIC GARDENS, SINGAPORE, 1960

Reading Daily at 8.00 a.m. Local Time at Orchid Enclosure from 1-1-60

1960	Total Rainfall	Highest fall in 24 hours	No. of days Rainfall	Mean Max. Temp.	Highest Max. Temp.	Mean Min. Temp.	Lowest Min. Temp.	Mean Temp. Dry Bulb	Mean Temp. Wet Bulb	Mean R. H. %	Mean Min. Grass Temp.	Mean Earth Temp. 4"	Mean Earth Temp. 1'	Mean Earth Temp. 4'	Mean Solar Radiation
	ins.	ins.		°F.	°F.	°F.	°F.	°F.	°F.	%	°F.	°F.	°F.	°F.	°F.
January ..	8.25	3.42	17	85.4	89.0	73.2	70.8	74.7	74.1	97.0	72.8	79.1	80.5	81.5	136.6
February ..	9.75	1.68	18	85.4	89.0	72.8	70.8	74.9	74.2	96.8	72.3	79.3	80.9	81.6	137.9
March ..	2.94	0.83	13	87.8	91.0	73.4	71.0	75.7	75.1	97.0	73.6	81.7	82.5	83.2	144.0
April ..	8.62	2.50	16	86.8	90.0	74.4	72.5	76.8	76.1	96.8	74.5	81.3	83.5	83.8	139.9
May ..	3.91	1.48	16	88.0	91.5	74.5	71.5	77.5	77.3	96.6	74.5	81.3	85.8	84.2	141.8
June ..	8.31	4.20	17	86.3	91.0	74.8	72.0	77.9	77.0	96.2	74.3	80.8	82.9	83.5	137.5
July ..	8.11	4.07	14	86.0	89.0	73.9	72.0	76.8	75.1	96.9	74.3	80.2	82.1	83.1	137.7
August ..	3.20	1.10	11	87.7	90.2	75.0	72.2	78.0	76.9	95.4	74.7	82.7	84.1	84.0	142.3
September ..	5.51	1.35	19	86.4	89.5	73.9	72.5	76.7	75.6	94.9	74.0	82.4	84.0	84.3	141.9
October ..	5.75	1.64	14	87.2	90.0	74.0	72.0	74.0	76.0	94.0	74.0	82.0	84.0	84.0	138.7
November ..	3.20	0.60	23	86.1	89.0	73.7	72.0	76.7	75.4	94.2	74.0	80.1	82.2	83.2	133.8
December ..	9.10	2.61	20	85.6	89.5	73.2	71.0	75.8	74.7	96.2	73.1	79.2	80.8	82.5	133.5
Total ..	76.65	..	198	..	..	..	..	..	..	..	..	..	..	..	..
Mean ..	..	..	..	86.6	89.9	73.9	71.7	76.4	75.6	96.0	73.8	80.9	82.6	83.3	138.8

SUMMARY OF DISTRIBUTION OF GIFTS, EXCHANGES AND
LOANS OF HERBARIUM SHEETS

Institution	NUMBER OF SPECIMENS			
	GIFTS AND EXCHANGE		LOANS	
	Out	In	Out	In
Mrs. B. E. Allen (Ipoh)	..	20	..	..
Amsterdam	..	..	10	..
Arnold Arboretum	514	..	..	..
Bailey Hortorium	121	..	..	..
Bangkok	50	..	..	6
Berlin	134	..	..	34
Bogor	247	505	..	265
Brisbane	70	..	..	..
British Ambassador to Laos	..	10	..	..
British Museum	40	..	36	200
Brunei	..	1,350	..	..
Brussels	..	100	21	..
Calcutta	9	..	..	..
Cambridge	23	..	..	55
Canberra	..	..	..	297
Copenhagen	..	23	..	10
Dehra Dun	9	..	..	..
Edinburgh	400	289	..	127
Florence	69	..	..	41
Geneva	3	..	..	33
Indian Department of Agriculture, West Bengal	..	..	480	..
Kepong, F.R.I.	48	..	..	..
Kew	795	..	2	3
Kuching	341	592	..	74
Kuala Lumpur—Department of Agriculture	..	..	34	..
Lae	88	326	..	..
Leiden	683	162	1,587	623
Malacca, Tropical Fish Culture Research Institute	3	..	..	..
Manila	124	291	..	..
Munich	25	..	..	44
New York	80	..	..	..
Paris	16	31	..	1
Saigon University	..	..	100	..
Sandakan	7	130	..	..
Stockholm	..	..	281	..
Sydney	2	..	..	..
Tokyo University	..	..	..	3
University of Malaya	..	..	44	..
Washington	..	..	..	19
Total ..	3,901	3,829	2,595	1,835

INSTITUTIONS AND PRIVATE COLLECTORS FROM WHOM PLANTS AND SEEDS WERE RECEIVED IN 1960

Australia	...	Nindethana Nursery, N.S.W.
Argentina	...	Instituto de Botanico, Ministerio de Agriculture, Buenos Aires.
Bermuda	...	Botanical Gardens, Paget East.
Brunei	...	Dr. K. F. D. Sweetman, Seria.
Federation of Malaya	...	Kedah: Mr. Lee Ewe Boon, Alor Star. Penang: Botanic Gardens. Perak: Mr. E. L. Spykerman, Ipoh. Selangor: Kepong: Forest Research Institute. Kuala Lumpur: Che Yacob b. Abdul Latiff Lake Gardens and Parks Mr. A. A. Allen Mr. Chew Sze Foong Rubber Research Institute of Malaya Mr. Verghese, Department of Agriculture Mrs. Fernando. Petaling Jaya: Mrs. H. Jones. Johore: Istana Gardens, Johore Bahru Nam Heng Estate, Kota Tinggi.
Finland	...	Dr. Rieno Alava, Turku.
France	...	Botanic Gardens of the University of Besancon.
Hong Kong	...	Garden Division, Urban Services Department.
India	...	Rubber Research Institute of India, Kottayam.
Indonesia	...	Mr. Yap Sian Too, Bandung; Kebun Raya Indonesia, Bogor, Herbarium Bogoriense.
Japan	...	Osaka City University Botanic Gardens, Osaka.
Mauritius	...	Sugar Industry, Research Institute, Reduit.
New Zealand	...	Leslie D. Foote, New Plymouth.
New Guinea	...	Dept. of Forests, Lae; Mr. G. C. Elworthy, Port Moresby.
North Borneo	...	Agricultural Officer, Tawau; Forest Dept., Sandakan.
Singapore	...	Mr. Chia Kay Heng; Mrs. Max Lewis; Mr. Tan Chye Siam; Mr. Wilgie Heng; Kian Kee Garden; Capt. Taylor; Dr. Furtado; M/s. E. V. Lin; Mr. A. Zehnder; Mr. Choo Yeok Koon; Dr. Au Kee Hock; Mr. George C. C. Chan; Che Hassan Rani; Mr. Yap Cheng Beng; Mr. Alfred Lye; H.E. Yang di-Pertuan Negara; Mrs. Jarvis; Mrs. Richard Terence Down; University of Malaya; Mrs. Heaslett; Mr. Ng Chong Ling; Mr. Wong Kak Sing.
South Africa	...	Mrs. F. Van Eeden, Natal.
Sarawak	...	Mr. Ong Kee Chong, Kuching; Mr. C. K. San, Kuching; Mr. Wee Ghim Swee, Kuching.
Thailand	...	Mr. Rapee Sagarik, Bangkok.
U.S.A.	...	State and County Arboretum, Arcadia, California; California Jungle Gardens, Los Angeles; Edwin A. Menninger, Florida; Foster Botanic Gardens, Honolulu, Hawaii.
U.K.	...	Royal Botanic Garden, Edinburgh, Dept. of Botany, University of Hull; Botanic Gardens, Glasgow; Royal Botanic Gardens, Kew; Dr. R. E. Holttum, Kew.

INSTITUTIONS AND PRIVATE COLLECTORS TO WHOM PLANTS AND SEEDS WERE SENT IN 1960

Argentina	...	Instituto de Botanica Agricola, Buenos Aires.
Australia	...	Botanic Gardens of Adelaide, Brisbane and Melbourne.
Austria	...	Botanic Gardens of the Universities of Vienna and Graz.
Algeria	...	Institut Scientifique Cherifien, Rabat; Jardin d'Essai, Hamma.
Bermuda	...	Department of Agriculture, Paget East.
Brunei	...	Dr. K. F. D. Sweetman, Seria.
Belgium	...	Jardin Botanique de Louvain; Plantentium, Antwerp.
Brazil	...	Instituto Agronomico do estado de Sao Paulo, Campinas.
Canada	...	Plant Research Institution, Department of Agriculture, Ottawa; Montreal Botanical Garden.
Cook Island	...	Department of Agriculture.
Czechoslovakia	...	Botanic Gardens of Karloveska University, Bratislava; Botanic Gardens of University of Brno; Botanic Gardens, Kosice; Botanic Gardens of Charles University, Prague; Institute for Natural Sciences, Prague; Vyzkumny Ustav Krmivarskya, Mr. Davidik Vaclav, Krasna Flora; Mr. Kotoucek, Horni Borg.
Denmark	...	Botanic Garden of the University of Copenhagen.
France	...	Ministere de l'Agriculture, Pathologie vegetale, Cap D'Antibes; Jardin Botanique de la ville de Nancy; Jardin Botanique Toulouse; Jardin Botanique de Caen; Jardin Botanique, Besancon; Director, Jardin Botanique, ville de Lyon; Universite de Toulouse; Institute de Botanique, Strasbourg; Hortus Botanicus, Insulaecivitatibus, Lilla-Nord; Director Botanique "Laleona" Station, Beaulieu; Museum National, Paris 5c; Monsieur A. Pitot, Professor de Botanique, Caen, Calvado.
Fiji	...	Conservator of Forests, Suva.
Finland	...	The Curator, Botanic Gardens, Turku; Dr. Reino Alava, Turku.
Federation of Malaya	...	Istana Gardens, Johore; State Forest Officer, Kuantan; Botanic Gardens, Penang; Mr. A. A. Allen, Kuala Lumpur; Mr. Verghese, Department of Agriculture, Kuala Lumpur; Mr. E. L. Spykerman, Veterinary Department, Ipoh; Montfort Boys Home and Training Centre, Batu Tiga, Selangor; Rubber Research Institute, Kuala Lumpur; Forest Research Institute, Kepong; Mr. P. Kuok, Johore Bahru.
Ghana	...	Botany Department, University College, Lagos.
Germany	...	Botanic Gardens of:—Dresden: University of Frankfurt-am-Main: Tubingen: Bonn: Halle: Darmstadt: Munster: Jena: Hamburg: Kassel: Essen: Wurzburg: Oberholz bei Leipzig: Dortmund: Berlin: Greifswald: Rostok University: Erlangen University: Cologne University: Technical High School Karlsruhe: Potsdam: Freiburg: Landes University, Westfalia.
Holland	...	Botanic Gardens of:—Amsterdam; Delft; Leiden; Landbouwhogeschool, Wageningen.
Hungary	...	Botanical University, Szeged; Botanic Gardens of Pecs, Vacratots and University of Budapest: Agrobotanic Garden, Godollo.

Hongkong	...	...	The Superintendent of Gardens, Urban Service Department.
Indonesia	...	...	Mr. Yap Sian Too, Bandung.
India	...	...	Indian Agriculture Research Institution, New Delhi; National Botanic Gardens, Lucknow; Dr. Mrs. S. Chitale, Nagpur.
Italy	...	...	Institute and Botanic Gardens of the Universities of Modena, Pisa, Catania, and Naples.
Japan	...	...	Izu Pharmaceutical Garden, 155, Shimohamo, Minamia-Shizuoka-ken; Eiti Midosikawa, Tijosei-Gun, Kiba-ken; Toshihito Satake, Saijomachi, Kamugun, Hiroshima-ken; Mr. Yukio Miyazaki, Minami-izumachi, Kamo-gun, Shizuoka-Prefecture; Shigeki Onchiyama, National Kyushu Regional, Agric. Experimental Station, Kagoshima Prefecture; Botanic Gardens of Osaka, Kisaiki; Kitakawachi, Osaka; V. Segawa, Kosobe Flori-cultural Station, Kyoto University, Kosobe, Takatsuki, Osaka; Mr. R. Hatta, Takeda Herbal Gardens, Kyoto.
Jamaica	...	...	Jamaica Agriculture Society, Kingston.
Kenya	...	...	Parks Superintendent, Nairobi; The Grahame Bell Co. Ltd., Nairobi; Forestry Research Organisation, Kikuyu.
Mariana Islands	...	...	Director of Agriculture, Guam.
North Borneo	...	...	Jesselton Town Board.
New Caledonia	...	...	South Pacific Commission, Noumea.
New Guinea	...	...	Division of Botany, Lae; Mr. G. C. Elworthy, Port Moresby, Papua; Mr. Blood.
New Zealand	...	...	Botanic Gardens, Christchurch; Mr. Gay Jamieson, Napier.
Philippine Island	...	...	Mrs. R. P. Gardener, c/o Philippine Rubber Project & Co., Zamboanga.
Poland	...	...	Hortus Botanicus, Universitatis, Warszawa, Hortus Botanicus, Poznan; Hortus Director, Zaklad Uniwersytetu, Miłslajakoperinku, Toxun; Hortus Plantarum, Academiae Medical, Warszawa-Polska.
Portugal	...	...	Institute Botanico Coimbra; Instituto Botanico, Lisboa; Estacao Agronomica Nacional, Sacavem.
Sarawak	...	...	Mr. John Seal, Kuching; Mr. Ong Kee Chong, Kuching.
Singapore	...	...	Mrs. Lewis; Mr. Tan Chye Siam; Kian Kee Gardens; Mr. Chia Kay Heng; Mr. Wilgie Heng; Coronation Nursery; The Japanese Consul-General; The Manager, Southseas Commodities Ltd.; Mr. L. B. Stewart; Mrs. Jarvis.
South Africa	...	...	University of Pretoria; Botanic Gardens of S. A., Worcester, E. H. Stein, Daleside Estate Nurseries, Transvaal.
South Rhodesia	...	...	J. H. Blackwood, Murply, Carpenham, Melsetter, South Rhodesia.
Spain	...	...	Instituto Botanico, Barcelona.
Sweden	...	...	Universitetets Botaniska, Lund.
Switzerland	...	...	Botanischer Garten, St. Gallen; Botanic Garden, Bern.
Tunisia	...	...	Director, Service Botanique, Ariana.
U.K.	...	...	Royal Botanic Garden, Edinburgh; University Botanic Gardens, Cambridge; University of London; Royal Botanic Gardens, Kew; Botanic Gardens, Glasgow; Sandhurst Nurseries, Camberley; Department of Botany, St. Andrews University; Mr. Peter Smithers, M. P., London, S.W.1; Major V. F. Howell, Cobham; The University, Leeds; M. R. Henderson, Aberdeen.

- U.S.A. E. A. Menninger, Florida; Rev. D. Pearce, North Carolina; Mr. Ross H. Gast, California; The Botanic Gardens, University of California; Fairchild Tropical Gardens, Florida; California Jungle Gardens; Dept. of Education, Longwood Gardens, Pennsylvania; Department of Horticulture, University of Hawaii, Honolulu; Foster Botanical Gardens, Honolulu.
- U.S.S.R. Jardin Botanique de l'Universite Mockba, Moscow; Hortus Botanicus Universitatu Latviensis, Latvia; Hortus Botanicus Fominianus, Kiev; Hortus Botanicus Murmansk; Hortus Botanicus Principalis, Academiae Scientiarum, Moscow; Academiae Scientiarum, Ashkhabad; Botanic Gardens, Tomsk; Horti Botanic, Ukraine; Botanic Gardens, Erevan, Armenia; Prof. A. A. Pristupa, Rostov on Don, Botanical Cabinet of Pedagogici Institute; Teodor Bahams, Smilahu iela, 16, Felgava, Latvia.
- Yugoslavia ... Hortus Botanicus, Zagreb.

APPENDIX VII

MAP SHOWING LOCATION OF MALAYAN PLACE NAMES MENTIONED
IN THIS REPORT



10 4

